
Bay Area Freeway Concept of Operations



Key Institutional and Technical Issues

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1. Introduction

1.1 Purpose

The California Highway Patrol (CHP), Metropolitan Transportation Commission (MTC) and the California Department of Transportation (Caltrans) District 4, the regional partners, have undertaken a Concept of Operations Study for the San Francisco Bay region. The goal of the study is to identify strategies to effectively manage recurring traffic congestion, incident response, traveler information and corridor management on freeways in the Bay Area.

The Bay Area Freeway Concept of Operations project will document the existing freeway operations policies, procedures, and practices; build consensus on the roles, responsibilities, and resource needs for freeway operations; and present recommendations to improve the regional and local roles and responsibilities. Phase 1 of the Concept of Operations project will result in a Freeway Operations Strategy Report that recommends the future direction for freeway operations in the Bay Area, and an Action Plan that will guide future work on the Concept of Operations.

One of the components of Phase 1 is the development of Key Institutional and Technical Issues. This task involves identifying, describing and prioritizing institutional and technical issues that affect freeway operations in the Bay Area. Many of the key institutional issues are related to interagency coordination and cooperation and policies and procedures between regional and local agencies. Many of the technical issues are associated with the regional traffic management center (TMC) and its architecture. This report contains a description of key institutional and technical issues identified to date.

Several sources of information have been used to prepare this report as listed below:

1.2 Sources of Information

Inventory of Freeway Operations

As a part of the Inventory of the Freeway Operations with the partner agencies and the local agencies, some of the key institutional and technical issues were identified by the agencies. During the interview process, a number of key issues involving regional and local agencies were discussed between the stakeholders and the interviewing team.

Literature Review

The second source of information for this report was derived from the documents and reports gathered as a part of the inventory and data collection tasks. Examples of these documents include existing cooperative agreements and memoranda of understanding between agencies relating to freeway operations, regional ITS architecture initiatives, the

Caltrans TOS/TMC Implementation Plan, the Regional Transportation Management Plan, products from Smart Corridor Projects and other documents collected during the Inventory process.

Public Agency Meetings

The third source of information was input obtained from the local agency stakeholders. Public agency workshops were held on May 30 and August 15 to gather information about interagency coordination and cooperation needs and institutional and technical issues related to the freeway management program in the Bay Area. The first workshop resulted in a preliminary list of issues that was refined and presented to the stakeholders at the second workshop. The second workshop involved further refining the list and assigning high priorities to the issues that the stakeholders viewed to be the most important.

TAC and Executive Committee Input

The final source of information has been the input from the TAC and Executive Committee. These discussions involved clarifying institutional and technical issues associated with freeway operations. Much of the TAC input was focused on actions to improve interagency coordination and cooperation.

2. Background

The purpose of this section is to provide some historical perspective and background information leading up to the institutional and technical issues discussed in Sections 3 and 4.

2.1 History of the System

Caltrans started their freeway management program and implementation of their Traffic Operations System (TOS) in 1991. JHK and Associates was retained to complete a Strategic Plan and the design of the Freeway Management System. However, due to funding restrictions, the project was put on hold for a period of time. Caltrans has continued to work on completing the TOS system within the available budget allocations, and is continuing with the enhancements to the program. Currently, Caltrans is in the process of developing an Implementation Plan for the build out of the TOS system.

TravInfo® began development on June 1, 1993, after being selected by the United States Department of Transportation (USDOT) as a demonstration project, and it began operations in August 1996. In 1998 the field operations test phase ended and TravInfo® transitioned to a fully deployed system. In 2001, MTC has retained PB Farradyne to design, build, operate, and maintain the TravInfo® for the next 4 to 6 years.

In the early 1990s, MTC initiated the Service Authority for Freeways and Expressways (SAFE) the Bay Area. SAFE includes the freeway service patrol (FSP) and call box programs. The FSP program has been operated as a three-way partnership, and some integration has been accomplished among the systems that serve the FSP tow trucks, the CHP CAD system, TravInfo®, and Caltrans. However, these systems have largely been piecemeal and not part of a larger regional freeway management system.

CHP has always been responsible for law enforcement and incident management on the freeways in California. They are the scene commander for incident management on the freeways and are primarily responsible for traffic control during incidents. CHP has had a computer-aided dispatch (CAD) system in place, with plans to replace the system on a statewide level. The time frame for the replacement/upgrade of the CAD system is not known.

Historically, the three regional agencies have operated their separate systems independent of each other. Although there have been recent integration efforts, this separate system operation is the core of some of the key institutional issues with the Bay Area freeway operations.

2.2 Current System Functionality

The current freeway management system is a coordinated, but independent operation of the various freeway management components by the three regional agencies. The three regional agencies share the same vision and goal for the reduction of congestion and improvement of safety and efficiency.

Broadly defined, the freeway management system includes the Caltrans TMC for its Traffic Operations System (TOS), the MTC TravInfo® Traveler Information Center (TIC), and CHP's dispatch center. Caltrans Maintenance, Caltrans' Traffic Management Team, CHP troopers, local fire and police departments, local transportation agencies, and MTC's FSP and call box programs are also integral to the freeway management system providing incident management and traffic control. Other systems that may interact with the freeway management system include smart corridor systems such as the Silicon Valley Smart Corridor and the Alameda County Smart Corridor, which are operated by partnering local transportation agencies.

The TMC is located on the 6th floor of the Caltrans District 4 headquarters building in downtown Oakland. The purpose of the Caltrans TMC is to monitor traffic flow and incidents on freeways in the Bay Area 24 hours per day and seven days per week. The TMC is designed to provide traffic surveillance, traffic management and coordination with other agencies. The TMC is equipped with computers, communications equipment and displays and is manned by Caltrans engineers and maintenance personnel, CHP personnel, dispatchers and TIC operators. The TMC acts as the hub for the Bay Area TOS.

The Bay Area TOS is designed to gather real time incident and traffic flow data, verify reported incidents, disseminate information to motorists, monitor incidents and manage traffic flow on the freeway network. The system uses a variety of data collection and dissemination devices including loop detectors, closed circuit television (CCTV) cameras, changeable message signs (CMS), highway advisory radio (HAR) and ramp meters. The TOS also contains various wireline and wireless communications devices to transmit data and video images between field locations and the TMC.

The TravInfo® TIC is the Bay Area's traveler information clearinghouse. Information is gathered from a variety of sources including the TOS, the CHP CAD, CHP beat calls, FSP and call boxes. MTC also plans to implement a data collection system of their own to enhance these data sources. Currently, this information is shared with private agencies that can use the information to provide traveler information to the public. TravInfo® also disseminates traveler information to the public via a call in system.

MTC has secured a contractor to act as a system manager to upgrade the entire TravInfo® system over the next 4 to 6 years. The upgraded system will integrate data from TravInfo®'s data collection system, Caltrans TMC, local TMCs and CHP CAD and provide this data to the public and other interested agencies in a consistent user-friendly

format. Some of the planned data dissemination devices include a web server interface and kiosks.

3. Institutional Issues

The existing written policies and procedures of Caltrans, CHP, MTC and local agencies for freeway operations do not create conflicts between the agencies, but they can be improved to more clearly address the roles, responsibilities and resources needed for freeway operations.

The following are a number of institutional issues that have been identified by the consultant team during the interviews and other data collection efforts. The institutional issues are numbered sequentially with the letter "I" (for institutional) preceding the number. The issues are grouped into the following topical areas: Interagency Coordination and Cooperation, Strategic and Implementation Plans, Data Sharing Policies and Procedures, Staffing and Funding Resources, and Performance Monitoring.

3.1 Interagency Coordination and Cooperation

Interagency coordination and cooperation is crucial for the success of the regional freeway management program in the Bay Area. The most important aspect of this is coordination and cooperation is between Caltrans, MTC and CHP, but local agencies' cooperation and coordination is also essential.

I-1) Disparate Roles, Responsibilities and Resources for Regional Agencies

The three regional agencies have separate goals, staffs, and operating procedures, and each is responsible for separate freeway operation activities. There currently isn't a seamless and comprehensive program that sets forth a clear vision, sharing of responsibilities, accountability, and credit for all participants. There are a number of options that can be implemented to achieve this goal. These options include:

- Improved Memorandum of Understanding (MOU) between the three agencies, defining roles and responsibilities
- A Cooperative Agreement that sets specific legal requirements for each agency to operate their designated portion of the freeway operations
- A Joint Powers Agreement that sets specific legal and policy level directives for development of policies, funding, operational plan, and all other aspects of a joint freeway operations program. An example of this institutional arrangement is the Las Vegas FAST program.
- A Separate Public Entity where the three regional agencies resources are pooled together for the singular purpose of freeway operations. Resources, funding, operational theater, policies, strategic plans, and other aspects of the program will be unified under one organization. An example of this institutional arrangement is the Houston's TranStar Program.

- A Quasi-Public Agency that operates and manages the freeway operations in the Bay Area, including all relevant components. An example of this institutional arrangement is the TRANSCOM System in New York.

I-2) Statewide Institutional Layer

CHP and Caltrans are state agencies, with major policy decisions and priorities being set based on statewide perspectives, while MTC is focused on the needs of the Bay Area. Since each of the agencies reports to a different group of policy makers, they often have different priorities. For example, Caltrans and CHP conform to statewide policies and priorities, while MTC and local agencies conform to local policies and priorities. The different policies and priorities can result in inefficient freeway operation. For example, the CHP CAD system needs to be upgraded and tailored to improve freeway operations in the Bay Area, but the CAD system is a statewide system and cannot be tailored to regional needs.

I-3) Incident Detection Methods

Incident detection and identification systems should be better integrated. The TMC uses incident detection algorithms that process loop detector data to identify potential incidents while TravInfo® relies more on incident reports coming into the TMC and CHP CAD from call boxes, FSP, 911 and other sources.

I-4) Separate Regional Operations Centers

The three regional operations centers - CHP communications center, TravInfo® TIC and Caltrans TMC - are physically separated. For an integrated freeway management program, it may be more efficient to have these operations centers located together. Houston's TranStar Program has a unified, multi-agency operations center that is considered to be very successful.

I-5) Ramp Meter Policy

There needs to be a region wide ramp metering policy that guides Caltrans and local agencies in addressing issues specific to each corridor while ensuring equity across corridors and agencies. Caltrans generally wants to maximize corridor operations, and local agencies typically are concerned that ramp metering will restrict their access to the freeway and interfere with local traffic flow, while providing a benefit to "longer distance" commuters already on the freeway. The lack of an accepted policy to address ramp meter operations and regional equity issues makes it difficult to implement ramp metering in the Bay Area.

I-6) Coordination of Ramp Meters with Arterial Management Systems

Additionally, some of the local agencies have indicated the need for policies regarding the coordination of ramp meters with nearby traffic signals on arterials. Some cities have

Letters of Understanding to permit Caltrans to operate the traffic signal at the freeway ramp terminal and the next nearest signal. However, not all cities have agreements in place and some have lack of coordination with ramp and city signal coordination, thus inhibiting smooth traffic flow on city streets.

I-7) Cross-Training for Incident Management

There is a need for a coordinated training between incident management agencies and incident responders such as CHP, fire departments, police departments, emergency medical service (EMS) units, Caltrans Maintenance, the Caltrans Traffic Management Team, FSP, and local agencies. Lack of coordinated training and clear jurisdictional authority delay response and exacerbate the traffic impacts of accidents, incidents, and events. Many fire departments indicated a need for cross training between agencies; however, most did not indicate a need for formal policies or written agreements.

I-8) Coordination between CHP and Coroner

The California Vehicle Code prohibits a coroner from driving an emergency vehicle to the location of a fatal accident. The law prohibits the moving a deceased person until the coroner's investigation has been completed. Without a siren and emergency lights, the coroner may take an hour or two to reach the scene. Coroners commonly request a CHP escort if there is severe congestion, but typically are not escorted. This delay in getting the coroner to the accident scene can significantly affect the severity and duration of the congestion following a fatal accident.

I-9) Coordination between Caltrans and FSP

There needs to be better coordination between FSP, Caltrans Maintenance and the Caltrans Traffic Management Team during incident response and traffic mitigation activities. The FSP tow service and Caltrans Orange Tow Truck service have only been partially integrated, which has led to inefficient clearing of incidents on the freeway. Further, Caltrans and FSP could improve coordination during large construction projects. FSP should be integrated into Caltrans' traffic mitigation plans to ensure a more seamless operation.

3.2 Strategic and Implementation Plans

I-10) Regional Strategic Planning for System Implementation and Integration

The need for an overall strategic plan to migrate from the existing system, which consists of numerous independent system components, into an integrated system, is evident. The plan will provide a blueprint for how traffic and incident data will be collected, integrated and distributed by the three agencies. The plan will address how to integrate probe data from TravInfo®, FSP and CLEAR, detector data from TOS and incident data from CHP CAD and call boxes and disseminate this information to the public. Communications issues such as how to transmit data from the field to TMC and from TMC to other TMCs

will need to be addressed. The plan should include a schedule for system implementation and integration and sources of funding.

I-11) Strategic Planning for TOS/TMC Implementation

Local agencies indicated a desire for more information regarding the current status and next steps of planned freeway management programs. In particular, they need to know the implementation schedules and status of funding for Caltrans TOS and TMC so that they can plan implementation of their systems accordingly. They indicated that it would be helpful if there were some standardized way of receiving this information.

Caltrans is in the process of updating their TOS/TMC Implementation Plan. This plan will encompass all aspects of the TOS including field elements, communications systems and the TMC. The plan is an important part of the Regional Strategic and Implementation Plan and needs to be shared with other regional and local agencies as it is developed.

3.3 Data Sharing Policies and Procedures

I-12) Overall Data Sharing Policy

There is a definite need for a policy that defines how video and other real time data are shared between Caltrans, MTC, CHP, Smart Corridor Programs, local transportation agencies, and the media. This data may include real time traffic data and live CCTV images collected by the agencies. The policy should also cover which messages are disseminated over various agencies' highway advisory radios (HAR) and changeable message signs (CMS). In addition, the policy needs to address how costs associated with data sharing will be handled. With the current leased communication systems, a cost is incurred each time data is shared between agencies. Any data sharing policy that is developed will have to be consistent with statewide policies and procedures.

I-13) CHP/TravInfo®/TMC Data Sharing

TravInfo® and Caltrans can improve their services to the public by getting a direct data stream of freeway incidents from CHP's CAD. CHP and TravInfo® are currently preparing an agreement to permit sharing of data. Similarly, there needs to be a policy for sharing Caltrans real time speed data with other agencies. Again, any data sharing policy that is developed will have to be consistent with statewide policies and procedures.

3.4 Staffing and Funding Resources

A major institutional issue in the Bay Area is that Caltrans is underfunded and understaffed. This is a key issue with regard to TOS expansion and the operations and maintenance of TOS field elements. There are also funding and staffing issues with the other regional agencies and local agencies.

I-14) Caltrans Funding for TOS Expansion

While a valuable source of traffic information, the TOS system should be expanded to provide coverage for the entire Bay Area freeway network. Many of those interviewed during the inventory indicated that the TOS system needs to be expanded to cover more miles of the freeway in the Bay Area. Funding for the expansion of the TOS will require regional support.

I-15) Caltrans Staffing and Funding for O&M

Many of Caltrans' existing ITS field elements need to be upgraded or maintained to ensure that each site is fully operational. In order to improve freeway operations in the Bay Area, Caltrans needs resources for the inspection, operation and maintenance of all TOS and TMC components. If shortfalls are identified, it may be necessary to secure funding for continued operations and maintenance of all TOS and TMC components. Funding for the operations and maintenance of the TOS requires regional support.

In addition to funding needs, Caltrans' does not have the staff needed to properly maintain the existing field elements. It was noted in the interviews that Caltrans' existing staff needs additional training to operate and maintain the TMC and TOS. This includes training staff to maintain TOS components in the field to ensure that they are fully operational and training staff to monitor the freeways from the TMC.

I-16) CHP Staffing and Funding

There are also staffing and resource issues outside of Caltrans. The CHP CAD system needs to be upgraded; however, without funding sources identified, there is no immediate plan for this to happen. Also, CHP answers statewide cellular 911 calls. However, roughly 60% of the 4800 calls per month are accidental or non-emergency calls. This problem interferes with true emergency calls and places a strain on CHP resources at the call center.

I-17) Local Agency Staffing and Funding

Few of the local agencies interviewed were able to specifically identify the staff resources and budget related to the freeway operations components. Budgets for operations components were typically combined with other resources and were not easily separated.

I-18) MTC SAFE Staffing and Funding

MTC needs a continuous source of funds for TravInfo®, FSP and call boxes. The demand for the Freeway Service Patrol (FSP) program is expanding throughout the Bay Area but it is difficult to attract and retain FSP drivers in a tight labor market. MTC is working on a strategic and financial plan for the call box program, which evaluates changes in the program due to the growing use of cellular phones to notify CHP of

incidents. Funds for the TravInfo® contractor have been programmed for the next few years, but long term funds for the system and MTC's program management need to be secured.

3.5 Performance Monitoring

I-19) Coordinated Performance Monitoring

There is a need for a coordinated performance-monitoring program that addresses the priorities of all of the regional and local agencies in the Bay Area. This program should use common performance measures to evaluate the performance of the overall system. For instance, the program should monitor how quickly the incident was cleared (CHP priority) and how quickly and safely the victims were given medical attention (Fire Department and EMS priority).

It should be noted that performance monitoring would likely require additional resources and funding. The TOS loop detectors may be used for performance measurements but they need to be expanded and properly maintained to ensure that they cover the entire Bay Area freeway network and are fully operational.

4. Technical Issues

The following are a number of technical issues that have been communicated to the consultant team so far during the interview process. The technical issues are numbered sequentially with the letter "T" (for technical) preceding the number. The technical issues are grouped into the following topical areas: TMC System Architecture, Regional Systems, and Regional Architecture.

4.1 TMC System Architecture

There are a number of technical issues associated with the TMC architecture including the complexity of operations and maintenance of TOS field equipment, upgrade of the TOS field elements, TMC-to-field and TMC-to-TMC communications systems and TMC software upgrades.

T-1) TOS Field Equipment O&M

As the TOS expands, whether in size or complexity, it will be harder for Caltrans to operate and maintain it. This is a technical issue that should be considered during the design of the system as well as during the design of interfaces between TOS/TMC and other systems.

In order to bring the overall system to complete functionality, there is a need for a detailed analysis of operations and maintenance requirements for all of the TOS components to ensure that needs are being met. This should be done before the system is deployed. This analysis will involve producing and maintaining an accurate inventory of all system elements and providing performance-monitoring mechanisms for field devices, communications systems and TMC components.

T-2) TOS Field Equipment Upgrades

There is an extensive need to upgrade or replace some existing TOS field equipment to improve the overall functionality of the system. Also, the large number of legacy systems complicates maintenance requirements for TOS field elements. Upgrades to legacy systems will simplify maintenance training and spare parts inventories. Successful upgrades to the TOS will require identifying funding (see I-15) and updating and following the Caltrans District 4 TOS/TMC Implementation Plan.

T-3) TMC-to-Field Elements Data and Video Exchange

The TOS uses a variety of communications technologies to transmit data and video images between field elements and the TMC. The TOS uses leased communication systems that do not provide the reliability necessary for a freeway management system of the Bay Area's magnitude. TravInfo® will soon begin to deploy a data collection system

with its own communications network. The Smart Corridors are also deploying communication systems, many of them adjacent to freeway segments. The Bay Area needs to investigate developing a comprehensive and reliable communications network for freeway operations.

T-4) TMC-to-TMC Data Exchange

Currently, there are a number of challenges in effective data and video exchange between the Caltrans TMC and local TMCs because of legacy systems. A center-to-center architecture needs to be developed based on industry standards and off-the-shelf software modules so that data can be shared between Caltrans and local agencies. Additionally, Caltrans needs to work with local traffic management and transit agencies to plan and deploy a shared regional communications network for data and video exchange between TMCs. A reliable high-speed communications network with adequate bandwidth for video transfer is critical for TMC to TMC data exchange.

T-5) TMC Software Upgrades

Software upgrades and enhancements will need to support the added functionality and enhanced architecture of the Regional TMC, consistent with the long-term Caltrans TMC interoperability and the needs of the Bay Area. The TMC software will also need upgrades to support “legacy” systems during the migration to an enhanced architecture. For instance, the system used in the TMC to access, control and view “legacy” CCTV cameras needs to be upgraded. Additionally, there needs to be an integrated approach to data archiving and retrieval, as well as an automated interface with the CHP CAD system.

4.2 Regional Systems

T-6) CHP CAD Upgrade

An automated means of data sharing between CHP’s CAD and other systems was one of the primary areas of concern expressed by the Partner agencies. Currently, the CHP CAD data has to be manually reentered into the TravInfo® and TMC systems. Also, incident data from the call box answering center has to be manually entered into the CAD. Automating these interfaces will require a major upgrade of the CAD system.

In general, the CAD system is required to perform many tasks that it wasn’t originally designed to do. There is a need for a statewide process to define the functional requirements for a new CAD with potential NTCIP-compliant interfaces.

T-7) TravInfo® Interfaces

TravInfo®’s usefulness is currently limited by lack of adequate real-time congestion data on the freeways. MTC will upgrade TravInfo® over the next 4 to 6 years to include its own data collection system, integration of data from others, and data dissemination

devices including a dial in phone line (which is now operational), a web server interface, and kiosks. The updated TravInfo® system will need to be developed with NTCIP-compliant interfaces so that the system will be compatible with the TMC, CHP CAD and other regional systems.

T-8) Call Box Interfaces

As mentioned in issue T-6, there needs to be an automated interface between the call box answering center and the CHP CAD. This interface will eliminate the need for CHP staff to have to manually reenter the call data into the CAD and will reduce the time it takes for calls to reach the CAD system. Also, the current CHP CAD system is not able to provide useful log data on location of incidents, which could be used by MTC for planning better call box deployment or better utilization of call boxes as surveillance devices.

T-9) FSP Interfaces

The full potential of the FSP computer is not being realized since it must interface with an archaic CAD system. FSP vehicles are equipped with automatic vehicle location (AVL) devices and mobile data terminals (MDTs) but the CAD system does not have the capability to use this data for dispatching. An updated CAD and improved interface between the FSP computer and CAD system would enable CHP to better dispatch FSP vehicles. Also, there is a need for a health monitoring system for both the CAD and the FSP computer to diagnose and respond to system problems early to avoid system failures.

T-10) Common Radio Frequency for Emergency Responders

Some local emergency response agencies noted the need for a common radio frequency when responding to incidents. This would allow Fire Departments, Police Departments, CHP and EMS units to all communicate on the same frequency when responding to an incident on the freeway. CHP has access to some common frequencies such as California Law Enforcement Radio System (CLERS) and California Law Enforcement Mutual Aid Radio System (CLEMARS). Some local agencies such as San Mateo Fire Department indicated that they use CALCORD, a mobile interagency mutual aide frequency. All emergency response agencies should have access to and established procedures for using a common emergency response frequency. It may also be useful for Caltrans Maintenance, the Caltrans Traffic Management Team and FSP to have access to this radio frequency.

4.3 Regional Architecture

T-11) Development of a Regional Architecture

One of the products of the Freeway Concept of Operations Project will be a freeway ITS architecture that will define the framework of the Bay Area freeway transportation system. A comprehensive regional ITS Architecture would ensure compatibility between

subsystems and sharing of data between institutions. MTC is leading the effort to develop a comprehensive regional ITS Architecture for the Bay Area. It is important that these two efforts are coordinated. Also, both architectures must be compliant with the National ITS Architecture and Caltrans center-to-center standards.

5. Recommendations

The recommendations in this section include a preliminary summary of the key institutional and technical issues described in this report and a description of the next steps to be taken in the Freeway Concept of Operations Project.

5.1 Summary of Preliminary Issues

Table 1 shows a summary of the key preliminary institutional and technical issues that were identified in sections 3 and 4, respectively. The issues are separated into high, medium or low priority issues. These priorities will help in the devising of a Freeway Operations Strategy and an Action Plan, which are described in Section 5.2.

Table 1: Prioritization of Key Issues

Institutional Issues	Technical Issues
<p><u>High Priority Issues</u></p> <ul style="list-style-type: none"> • I-1) Disparate roles, responsibilities and resources for regional agencies • I-5) Ramp meter policy • I-6) Coordination between ramp meters and arterial management systems • I-7) Cross-training for incident management • I-10) Regional strategic planning for system implementation and integration • I-11) Strategic planning for TOS/TMC implementation • I-12) Overall data sharing policy • I-13) CHP/TravInfo®/TMC data sharing • I-15) Caltrans staffing and funding for O&M 	<p><u>High Priority Issues</u></p> <ul style="list-style-type: none"> • T-1) TOS field equipment O&M • T-2) TOS field equipment upgrades • T-3) TMC-to-field data exchange • T-4) TMC-to-TMC data exchange • T-5) TMC software upgrades • T-6) CHP CAD Upgrade • T-11) Regional ITS Architecture
<p><u>Medium Priority Issues</u></p> <ul style="list-style-type: none"> • I-2) State level institutional layer • I-3) Incident Detection Methods • I-4) Separate regional operations centers • I-8) Coordination b/t CHP and Coroner • I-14) Caltrans funding for TOS expansion • I-19) Coordinated performance monitoring 	<p><u>Medium Priority Issues</u></p> <ul style="list-style-type: none"> • T-7) TravInfo® interfaces • T-8) Call Box interfaces • T-9) FSP interfaces • T-10) Common radio frequency for emergency responders

Institutional Issues	Technical Issues
<u>Low Priority Issues</u> <ul style="list-style-type: none"> • I-9) Coordination b/t Caltrans and FSP • I-16) CHP staffing and funding • I-17) Funding for local agencies • I-18) MTC SAFE funding 	<u>Low Priority Issues</u>

5.2 Next Steps

The remaining tasks needed to complete the Freeway Concept of Operations Project are the development of a Freeway Operations Strategy and an Action Plan. The Freeway Operations Strategy will summarize the key findings and conclusions from this project and define priorities and a process for how to achieve an effective freeway management program in the Bay Area. An emphasis will be placed on improving policies and procedures for the Freeway Management Program. The Action Plan will describe in detail the steps needed to implement the strategy.